

MAMMALIAN SPECIES No. 118, pp. 1–6, 3 figs.

Peromyscus eremicus. By Rita Veal and William Caire

Published 8 June 1979 by the American Society of Mammalogists

Peromyscus eremicus (Baird, 1858)

Cactus Mouse

Hesperomys eremicus Baird, 1858:479. Type locality "Fort Yuma, California," Imperial County, on Colorado River, opposite Yuma, Arizona.

Hesperomys (Vesperimus) anthonyi Merriam, 1887:5. Type locality Camp Apache, Big Hatchita Mountains, Hidalgo County, New Mexico.

Vesperimus fraterculus Miller, 1892:261. Type locality Dulzura, San Diego County, California.

Sitomys herronii Rhoads, 1893:832. Type locality Reche Canyon, San Bernardino County, California.

Peromyscus tiburonensis Mearns, 1897:720. Type locality Tiburón Island, Gulf of California, Sonora.

Peromyscus cedrosensis J. A. Allen, 1898:154. Type locality Cerros (=Cedros) Island, Baja California.

Peromyscus homochroia Elliot, 1903:158. Type locality San Quintin, Baja California.

CONTEXT AND CONTENT. Order Rodentia, Family Muridae, Subfamily Cricetinae, Subgenus *Haplomylomys*. Fifteen subspecies of *P. eremicus* are presently recognized of which eight are known only from their type localities and are indicated below with an asterisk (*) (Hall and Kelson, 1959; Anderson, 1972; Lawlor, 1971a, b).

P. e. eremicus (Baird, 1858:479), see above (*arenarius* Mearns a synonym).

P. e. anthonyi (Merriam, 1887:5), see above.

P. e. fraterculus (Miller, 1892:261), see above (*herronii* Rhoads, *nigellus* Rhoads, and *homochroia* Elliot are synonyms).

**P. e. tiburonensis* Mearns, 1897:720, see above.

**P. e. cedrosensis* J. A. Allen, 1898:154, see above.

P. e. phaeurus Osgood, 1904:75. Type locality Hacienda la Parada, San Luis Potosí.

**P. e. avius* Osgood, 1909:247. Type locality Ceralbo Island (=Cerralvo Island), Gulf of California, Baja California.

**P. e. insulicola* Osgood, 1909:246. Type locality Espíritu Santo Island, Gulf of California, Baja California.

**P. e. polypolius* Osgood, 1909:248. Type locality Margarita Island, off the west coast of southern Baja California.

P. e. papagensis Goldman, 1917:110. Type locality Sierra Pinacate, Sonora.

**P. e. cinereus* Hall, 1931:87. Type locality SW end San José Island, latitude 25°N, Baja California.

**P. e. collatus* Burt, 1932:172. Type locality Turners Island, latitude 28°19'W, Gulf of California, Sonora.

**P. e. pullus* Blossom, 1933:3. Type locality Black Mountain, 10 mi. S Tucson, Pima County, Arizona.

P. e. alcorni Anderson, 1972:341. Type locality 11 mi. NW San Buenaventura, Chihuahua, Mexico.

P. e. sinaloensis Anderson, 1972:342. Type locality 26 mi. NE Choix, Sinaloa, Mexico.

DIAGNOSIS. *Peromyscus eremicus* occurs sympatrically with four other species of the subgenus *Haplomylomys* (*P. californicus*, *P. crinitus*, *P. eva*, and *P. merriami*) and with two members of the *boylii* species group (*P. pectoralis* and *P. boylii*). Because of broad overlap of species ranges and extensive geographic variation in most characters of *P. eremicus* and other species of *Peromyscus*, the diagnostic characters at one locality may not be diagnostic at another locality. To insure proper identification a combination of characters are needed.

The best characters to distinguish males of *P. eremicus* from males of other sympatric *Peromyscus* are: baculum relatively short, broad (8.2 × 1.8 mm; Burt, 1960), and dorsally curved; base squarish and very small; cartilaginous tip diffuse; phallus small, broad, and with no lappets on glans; all male accessory reproductive glands present (Lawlor, 1971b).

In California, *P. eremicus* is recognizably smaller than *P. californicus*, which has external measurements (mm) of: total length, 220 to 266; tail length, 117 to 148; hind foot, 25 to 29; ear, 20 to 25 (Hall and Kelson, 1959). *Peromyscus californicus* also differs in having a well-haired tail and dark brown upper parts, and in lacking the ochraceous-buffy lateral line present in *P. eremicus*.

Externally *P. crinitus* can usually be distinguished from *P. eremicus* by a well-haired, tufted tail. Males of *P. crinitus* also differ in having a baculum with a small, rounded cartilaginous tip; a slender phallus with two median lappets ventrally and two dorsal lappets separated by a shallow median cleft; and no preputial glands (Lawlor, 1971b).

In southcentral Baja California, *P. eva* is distinguishable from *P. eremicus* by pelage which is shorter and appears more finely textured because it is colored with a blend of rufous, buffy, and brown (*P. eremicus* has a strong admixture of dark brown or black). *Peromyscus eremicus* has a less grayish face. *Peromyscus eva* also differs in having a much longer tail; longer skull, greater zygomatic breadth, longer nasal bones, and longer rostrum; a molar toothrow averaging greater in length and width; a shallower zygomatic notch; a zygoma generally rounded laterally instead of slightly concave (see figure 1); a greater number of tail vertebrae (36 in *P. eva* and 30 to 34 in *P. eremicus*); and a baculum with a narrower shaft, a rounded cartilaginous tip, and a small, rounded base (Lawlor, 1971b).

The relationships of *P. merriami* and *P. eremicus* have been investigated by Commissaris (1960), Hoffmeister and Lee (1963), and Lawlor (1971b). Lawlor (1971b) characterized *P. merriami* as having a larger size; a more robust skull due to relatively greater zygomatic breadth; generally a deeper zygomatic notch in dorsal view; a larger infraorbital canal; and a longer glans penis and a baculum with a narrow, straight (or ventrally curved) shaft and a rounded, narrow base. Other characters given by Hoffmeister and Lee (1963) are of less diagnostic value, especially on an interlocality basis. Where occurring sympatrically, *P. merriami* prefers shrubby, lowland areas of deep soil and *P. eremicus* prefers rocky areas (Commissaris, 1960; Lawlor, 1971b).

Peromyscus eremicus (as most other *Haplomylomys*) can usually be separated from *P. pectoralis* and *P. boylii* by its simple molar teeth which usually lack accessory styles or loph between the first and second main cusps of the upper molars.

GENERAL CHARACTERS. Considerable variation exists among the fifteen subspecies of *P. eremicus* as indicated by the following selected external and cranial measurements (mm): total length, 160 to 211; length of body, 72 to 100; length of tail, 84 to 120; length of hind foot, 18 to 22; length of ear, 13.4 to 20.0; greatest length of skull, 22.7 to 25.9; and zygomatic breadth, 11.2 to 13.5. Weight varies from 18 to 40 g with an average of 20 g. Additional measurements can be found in Brand and Ryckman (1969), Dice (1939) and Clark (1941). Dice (1939) described female *P. eremicus* as being significantly larger than males in body length, ear length, length of mandible, and bullar width of skull. Females also average slightly more than males in weight (Davis, 1966).

Externally *Peromyscus eremicus* is characterized by naked soles on the hind feet; a finely annulated, nearly naked tail which is equal to or usually longer than the head and body; relatively large, sparsely haired and membranous ears; and long, soft, silky pelage (figure 2). The coloration of the pelage varies among the subspecies and even among different populations. Dark populations are known to occur in the lava areas of Arizona (Benson, 1933), New Mexico (Findley *et al.*, 1975; Koschmann, 1974), and Sonora (Caire, 1978). In general, *P. eremicus* can be described as having upper parts of ochraceous-buff to cinnamon-buff washed with dusk; a lateral line of pure ochraceous-buff extending from along the sides to the outer surface of the front legs; a slightly bicolored tail, dusky on top and whitish below; sides and top of head slightly grayish; and upper parts white to buffy with



FIGURE 1. Dorsal, ventral, and lateral views of cranium, and lateral and occlusal views of lower jaw of *Peromyscus eremicus*, CSUCV 539, female from 3 mi. SW (by road) of Santa Rosa, Sonora, Mexico.

a buffy pectoral spot sometimes present. Dice (1939) found the pelage color of female cactus mice to be slightly paler than that of males, and noted that juvenile pelage was usually duller (gray) and less buffy than the adult pelage.

Male cactus mice have a full complement of reproductive glands, with well-developed preputial glands, whereas females have two pairs of inguinal mammary glands (Davis, 1966; Lawlor, 1971b).



FIGURE 2. Photograph of *Peromyscus eremicus* collected at Bahía de los Angeles, Baja California, by Timothy E. Lawlor.

DISTRIBUTION. The distribution of *Peromyscus eremicus* is shown in figure 3. *Peromyscus eremicus* is common in desert shrub and riparian habitats throughout the southwestern United States, north central Mexico, and Baja California. Insular records of the species include Cedros, Margarita, and Magdalena islands off the western coast of Baja California, and Cerralvo (=Cerralvo), Espíritu Santo, San José, and Tiburón islands, located in the Gulf of California (Caire, 1978; Hall and Kelson, 1959; Lawlor, 1971b). Gennaro (1968) suggested that the lower average annual temperature and/or the lack of mesquite (*Prosopis juliflora*) might limit the northern expansion of *P. eremicus* in the Rio Grande Valley of New Mexico. Southern limits of the range of *P. eremicus* coincide with the terminus of the Mexican highlands in central Mexico. *Peromyscus eremicus* have been taken from elevations of 35 m (Cockrum, 1960) to elevations of 2130 m (Hall, 1946).

FOSSIL RECORD. According to Tamsitt (1957), the subgenus *Haplomylomys* had a much wider distribution during the late Tertiary than at present. Martin (1968) referred one fossil mandible from the late Pleistocene deposits near Friesenhahn Cave, Bexar County, Texas, to *P. cf. eremicus* because the m_3 was notably reduced. A possible close relationship between *P. e. eremicus* and the Pleistocene *P. nesodytes* from Santa Rosa Island, Santa Barbara County, California, has been suggested by Wilson (1936).

FORM. The hyoid apparatus of *P. eremicus* has been described by Sprague (1941). The basihyal is flattened and little arched, and resembles that of *Onychomys leucogaster*. The entoglossal process of the basihyal is weakly developed, but the shoulders are prominent. The thyrohyals have noticeable flares and slightly developed trochanters. The spatulate shaped ceratohyals are well developed.

Hooper (1957) described the dental pattern of *P. eremicus* as being simple and tending to lack accessory styles and lophs. If accessory cusps occur, they are often a mesostyle in the upper molars, and an ectostyloid in the lower molars. The styles and stylids are less prominent than those in the species of the subgenus *Peromyscus*, which have more complex dental patterns. The second tooth in each jaw is simpler than the first.

Rinker (1963) compared the musculature of *P. eremicus*, *P. leucopus*, and *Ochrotomys nuttalli*. The following muscles of *P. eremicus* were structurally different from those of *P. leucopus* and *O. nuttalli*: pectoralis minor, gracilis anterior, adductor longus, adductor brevis, quadratus femoris, flexor digitorum tibialis, abductor ossis metatarsi V, and flexor hallucis brevis.

Hooper (1958) described the phallus of *P. eremicus* as having a vase-shaped glans, the body of which is covered with stubby spines; lappets are lacking; and the terminus of the glans consists of folds of soft nonspinous tissue. Blair (1942) and Hooper (1958) briefly described the baculum of *P. eremicus*.

Peromyscus eremicus lacks internal cheek pouches and has a mean lens weight of 17.4 mg (King, 1968). Rinker (1960) and Manville (1961) reported the presence of the entepicondylar foramen in the humerus of *P. eremicus*.

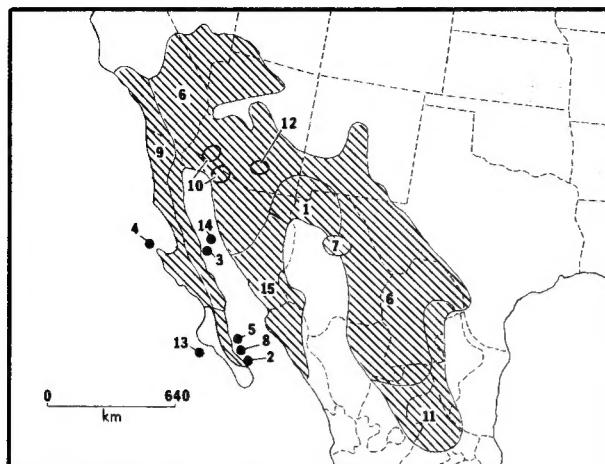


FIGURE 3. Geographic distribution of *Peromyscus eremicus*. Subspecies codes are: 1. *P. e. anthonyi*; 2. *P. e. avius*; 3. *P. e. collatus*; 4. *P. e. cedrosensis*; 5. *P. e. cinereus*; 6. *P. e. eremicus*; 7. *P. e. alcorni*; 8. *P. e. insulicola*; 9. *P. e. fraterculus*; 10. *P. e. papagensis*; 11. *P. e. phaeurus*; 12. *P. e. pullus*; 13. *P. e. polypolius*; 14. *P. e. tiburonensis*; 15. *P. e. sinaloensis*.

FUNCTION. Ogunsua *et al.* (1971) studied the adrenal steroid biosynthesis of *P. eremicus*. Peterson (1968) analyzed the blood serum patterns of *P. eremicus* by electrophoresis. The albumin mobility had a value of 96 and was monomorphic by serum electrophoresis (Brown and Welser, 1968). King and Vestal (1974) found the minimum visual angle of *P. eremicus* to be 6.6 ± 0.4 minutes of arc at 20 cm distance. Postejaculatory copulations of *P. eremicus* function in the halting of the estrous cycle and in triggering a functional luteal phase (Dewsbury and Estep, 1975). Water requirements, body temperature, and metabolism of *P. eremicus* have been studied in relation to adaptations to desert living by Lindeborg (1952), Murie (1961), McNab and Morrison (1963), MacMillen (1964, 1965), and Morhardt and Hudson (1966). Murie (1961) reported *P. eremicus* to have a 10 to 20% lower metabolic rate and to resort to saliva spreading for evaporative cooling at high temperatures less readily than *P. maniculatus*. Taste discrimination by *P. eremicus* for different concentrations of glucose has been studied by King (1968). Huestis (1925) described the microscopic hair characters, and Collins (1923) discussed the juvenile and postjuvenile pelage phases of *P. e. fraterculus*.

REPRODUCTION AND ONTOGENY. Fertilization and implantation in *P. eremicus* have not been investigated. The recorded gestation time for a non-lactating female is 21 days (Svihla, 1932). Ossification of the embryo occurs in a crano-caudal sequence, and the skeletal growth indices of the embryo are similar to those of the adult (Van de Graff, 1973). The calcaneus and the bony elements of the pes do not ossify prenatally (Van de Graff, 1973).

Average litter size has been reported to vary from 2.2 ($N = 14$, Brand and Ryckman, 1968) to 2.8 ($N = 372$, Drickamer and Vestal, 1973). Davis and Davis (1947) found a mean litter size of 2.4 ($N = 404$), and noted that the number of young increased with each successive litter, up to the fifth or sixth, and then decreased. Drickamer and Vestal (1973), however, found no significant change in litter size in successive litters of females. Hall (1946), Lewis (1972), and Svihla (1932) have also presented data on litter size. Davis and Davis (1947) gave a sex ratio of 64 males to 57 females (41 litters), while Brand and Ryckman (1968) reported 13 males to 17 females from 14 litters. Moor (1968) suggested that *P. eremicus* is probably reproductively active throughout the year in the lower desert areas but that reproduction is curtailed during the hot dry periods of summer. Lewis (1972) trapped males and females in breeding condition throughout the year with March through April appearing to be the peak breeding season. Under laboratory conditions, Drickamer and Vestal (1973) noted a seasonal breeding pattern of spring through autumn with a peak occurring during the months of increased day lengths. MacMillen (1964) proposed a seasonal reproductive cycle for males of *P. eremicus*. He trapped only males with atrophied testes in October and November, but caught males with increasing testicular size

from December through February, and found males with the most fully developed gonads from March through September. MacMillen (1964) suggested that females that become pregnant while lactating have a postpartum estrus and a prolongation of gestation; this would explain the occurrence of pregnant and lactating females during the nonfecund period of males.

Svihla (1932) reported a mean neonate weight of 2.5 g (range, 2.1 to 2.9) which was 13% of the adult weight, and Brand and Ryckman (1968) gave a mean neonate weight taken within 24 hours of birth as 2.23 g (range, 1.85 to 2.60) which was 11.1% of the mean adult weight. The naked neonates are pink except for a pigmented dorsum and usually have complete gray juvenile pelage after 14 days (Eisenberg, 1968). Collins (1923) and Dice (1939) discussed pelage phases of *P. eremicus*. According to Brand and Ryckman (1968), the postjuvenile molt begins between the 34th and 37th day. Neonates of *P. eremicus* move very little until about six days of age and emit an abandoned cry which is scarcely audible and which disappears after the eyes are open and the young gain coordinated locomotion (Eisenberg, 1968). Svihla (1932), Layne (1968), and Brand and Ryckman (1968) reported that the eyes opened on the average at 15.5 (15 to 17), 12.8 (10 to 15), and 11 to 15 days, respectively. Svihla (1932) stated that the pinnae elevated in less than one day. Brand and Ryckman (1968) reported that the external auditory meatus opened between 9 and 11 days, and found the upper and lower incisors to erupt through the gums at an average of 2.7 days (three litters). Brand and Ryckman (1968) and Eisenberg (1968) noted that the young of *P. eremicus* were weaned at 20 to 22 days, but King (1963) reported a weaning age of 44 days.

Lewis (1972) trapped lactating and pregnant females of subadult age. In laboratory colonies, Clark (1938a) reported the average age at first estrus to be 39.2 ± 1.5 days, the earliest age at first estrus to be 28 days, and the earliest age for conception to be 58 days. Davis and Davis (1947) listed the average age at first conception as 10 months, with 50 days (average) between litters. Several females showed an interval of only 28 to 30 days between litters which was followed by a rest of several months (Davis and Davis, 1947). This suggested a postpartum estrus to Brand and Ryckman (1968), who found similar results. Dewsbury *et al.* (1977) discuss the estrous cycle of *P. eremicus*.

ECOLOGY. *Peromyscus eremicus* inhabits a number of ecological associations. For example, individuals have been taken from the mesquite-grass, malpais lava, and desert mountain range associations of New Mexico (Blair, 1943; Findley *et al.*, 1975); the rock hill, Tamarix, and desert plain associations of Arizona (Lewis, 1972; Cahalane, 1939); the coastal sage scrub association and desert slopes of the San Gabriel Mountains in California (Vaughn, 1954); the creosote and desert shrub associations of southern Nevada (Bradley and Mauer, 1973); the thorn forest, short tree forest, and desert shrub associations of Sonora, Mexico (Caire, 1978); the desert shrub associations of the Trans-Pecos Texas area (Davis, 1966); riparian associations of Utah (Long, 1940); and the desert shrub associations of Durango and San Luis Potosí, Mexico (Baker and Greer, 1962; Dalquest, 1953). Cactus mice inhabit rocky situations at some localities (Davis, 1966; Vaughan, 1954; Blair, 1943; Lewis, 1972; MacMillen, 1964; Cahalane, 1939), but show a preference for sandy substrates (Dalquest, 1953; Cahalane, 1939; Baker and Greer, 1962; MacMillen, 1964) and loamy soils (Lewis, 1972; Long, 1940) at others. Findley *et al.* (1975) found *P. eremicus* to be restricted in varying degrees to the south-facing slopes of mountains during the winter months in New Mexico.

Cactus mice have been trapped along brush fences at Fort Lowell, Arizona, in open fields at Fairbank, Arizona, and Oposura, Mexico, around buildings at San Bernardino Ranch, Arizona (Allen, 1895), in stone walls near Bledos, Mexico (Dalquest, 1953), in huts and brush fences of the Papago Indians and the Mexican natives near Sonoyta and Quitobaquito, Sonora (Caire, 1978), and in the stick nests of *Neotoma fuscipes macrotis* in California (Gander, 1929). Cactus mice have been found nesting in rock heaps (Lewis, 1972) and stone walls (Dalquest, 1953), in burrows around the base of mesquites (Cahalane, 1939), and in the abandoned burrows of gophers and kangaroo rats (Caire, 1978). The nests of *P. eremicus* found in the brush fences near Sonoyta and Quitobaquito were of grass, feathers, stems, and leaves (Caire, 1978).

By using the smoked paper tracking technique, Meserve (1977) found *P. eremicus* to exhibit considerable arboreal activity on four of five dominant shrubs in a coastal sage scrub community of California. *Peromyscus eremicus* has been observed foraging in mesquite and hackberry trees (Davis, 1966).

Meserve (1976) described the diet of *P. eremicus* as consist-

ing primarily of fruit and flowers of shrubs. Seeds, insects, and green vegetation are consumed in varying amounts depending on seasonal abundance (Bradley and Mauer, 1973; Meserve, 1976). Most of its diet consists of seeds of various desert annuals (Dalquest, 1953; Davis, 1966), with mesquite beans, hackberry nutlets, insects, and green vegetation comprising the remainder (Davis, 1966). Insects were found to be important in the diet of *P. eremicus* by Reichman (1975) and Reichman and Van de Graff (1973a).

Two skulls of *P. eremicus* were recovered from pellets of barn owls (*Tyto alba*) from Sonora, Mexico (Bradshaw and Hayward, 1960), and the screech owl (*Otus asio*) was observed preying upon cactus mice by Miller and Stebbins (1964). Dice and Blossen (1937) reported a king snake killing and swallowing a cactus mouse.

Peromyscus eremicus is parasitized by the nematode *Gongylonema peromysci*, 15 species of mites, 9 species of chiggers, 4 species of ticks, 17 species of fleas, and 2 species of biting lice (Anoplura) (Whitaker, 1968; Wrenn and Loomis, 1974). Over half of the cactus mice trapped by Dalquest (1953) in San Luis Potosi, Mexico, had large bot fly larvae under the skin of their sides, backs, or between their shoulders.

Duran and Samz (1973) found *P. eremicus* more susceptible to being trapped than *Perognathus amplus*, *Neotoma albigenula*, and *Peromyscus maniculatus*, and noted that males were captured more frequently than females. Snap traps captured more individuals than live traps. Lewis (1972) suggested that males have a greater tendency to wander, thus making them more susceptible to trapping. Cactus mice have been trapped using these baits: rolled oats, sunflower seeds, whole grains, and a peanut butter and oatmeal mixture (Davis, 1966; Lewis, 1972). MacMillen (1964) and Reichman and Van de Graff (1973a) found the frequency of capture to be greater in areas of dense vegetation than in areas of sparse vegetation. Bradley and Mauer (1973) suggested that the distribution and density of *P. eremicus* in desert scrub communities increases with an increase in the cover area and density of vegetation.

In a California rodent community, McCloskey (1972) found *P. eremicus* to have a low and relatively stable population. In Arizona, Lewis (1972) reported a rather stable population, while Chew and Chew (1970) found *P. eremicus* to be the resident species with the least stable and lowest density. Meserve (1973) and Reichman and Van de Graff (1973a) observed that population numbers declined in fall and early winter and increased in spring. However, MacMillen (1964) and Lewis (1972) found high winter populations and low summer populations of *P. eremicus*. Chew and Chew (1970) discussed the role of *P. eremicus* in the energetics of a desert ecosystem. Ogston (1974) found that home ranges averaged 0.3 hectares. The home ranges of males overlapped considerably while those of the females showed almost no overlap (MacMillen, 1964).

Where *P. crinitus* and *P. eremicus* occur sympatrically, *P. crinitus* generally inhabits rocky areas, while *P. eremicus* generally inhabits brushy, flat desert floors (Eisenberg, 1963).

BEHAVIOR. *Peromyscus eremicus* was described as quiet and docile in captivity by Svhila (1932) and as excitable and shy by Brand and Ryckman (1968), who also noted that they seldom attempt to bite when handled. Murie (1961) reported *P. eremicus* to be generally more passive than *P. maniculatus*. *Peromyscus eremicus* is dominant over *Perognathus fallax*, is mutually intolerant with *Peromyscus maniculatus*, and is subordinate to *Neotoma lepida*, *Peromyscus californicus*, and *Dipodomys agilis* (MacMillen, 1964). MacMillen (1964) found individuals of *P. eremicus* to be mutually incompatible in the wild. In laboratory situations at low densities, individuals were considerably tolerant of each other, with a mated pair often remaining together through parturition (Eisenberg, 1963, 1968; Brand and Ryckman, 1968). But fighting and subsequent wounding of the rump and tail increased at higher densities (Eisenberg, 1963). Eisenberg (1963) described the social structure of *P. eremicus* as loose, with transient pairing, and described the "modified" fighting technique usually employed. Smith (1965) discussed the behavioral discrimination shown by allopatric and sympatric males of *P. eremicus* between females of *P. eremicus* and *P. californicus*. The copulatory behavior of *P. eremicus* was described by Dewsbury (1974). Pattering (rapid movement of forepaw up and down against the substrate, producing a soft, whirring sound) was frequently exhibited when adults of *P. eremicus* were disturbed (Svhila, 1932; Eisenberg, 1962). In adults, tooth-chattering was produced during aggressive arousal, squeals were produced in response to bites or injury, and single chirps were produced during

nest defense (Eisenberg, 1968). The ability of the neonates to attach themselves tightly to the teats and thus be transported by the mother is well developed in *P. eremicus* (Svhila, 1932; Eisenberg, 1968).

In the laboratory, *P. eremicus* built fluffy, globular, cotton nests (Brand and Ryckman, 1968).

Light reinforcement in *P. eremicus* was studied by King (1970). Owings and Lockard (1971) found *P. eremicus* to be most active on moonlit nights and *P. californicus* to be most active on moonless nights, and discussed these results in terms of a temporal dimension of competitive exclusion for these sympatric species. Of five taxa of *Peromyscus*, *P. eremicus* was found to exhibit the highest level of food hoarding. The amount of food hoarded apparently was not affected by temperature or photoperiod (Barry, 1976). In cactus mice, torpor is mainly circadian (torpid by day, active by night; MacMillen, 1972) and can be employed anytime their energy supplies become limited (Morrhardt and Hudson, 1966). MacMillen (1965, 1972) distinguished between winter (circadian) torpor, induced only by food restriction, and summer torpor, which may be circadian or may last two to three months. Summer torpor was induced by food restriction or by imposing a negative water balance. According to MacMillen (1964, 1965), cactus mice aestivate during the summer to conserve water and prolong food reserves.

King *et al.* (1968) conducted five behavior tests (running, swimming, climbing, digging, and gnawing) on eight taxa of *Peromyscus*, including *P. eremicus*. Cactus mice were good runners, but were slow to perform in most other tests.

GENETICS. Cross (1938) reported 58 chromosomes for *P. eremicus* but more recent studies (Clark *et al.*, 1973; Hsu and Arrighi, 1968; Lawlor, 1971a; Tein Kuo *et al.*, 1974) showed that the diploid number was 48. The autosomes of *P. eremicus* are all biarmed, with the larger ones being subtelocentric or submetacentric, and with many being morphologically similar. The smallest pair is nearly metacentric. The X chromosome is large with nearly equal arms, while the Y chromosome is usually a medium-sized submetacentric. According to Hsu and Arrighi (1968), *P. e. tiburonensis* has a small acrocentric Y, but Lawlor (1971a) considered it to be submetacentric, with the centromere very near the end of the long arm. Cactus mice have 96 chromosomal arms, consisting of 48 euchromatic acrocentric arms and 48 heterochromatic short arms with the centromeric regions also being heterochromatic (Clark *et al.*, 1973). Pathak *et al.* (1973) discussed the role of heterochromatin in karyotypic evolution, and Jalal *et al.* (1974) discussed cytological differentiation of constitutive heterochromatin.

Rasmussen and Koehn (1966) reported polymorphism for two serum transferrin components in *P. eremicus*, which are similar to those of *P. maniculatus* and *P. boylii*, but which are slower in migration. Avise *et al.* (1974) discussed biochemical polymorphism of *P. eremicus* and demonstrated potential geographic differences in allozyme properties.

Dice (1935) studied the inheritance of waltzing behavior and epilepsy, and Clark (1938b) studied pectoral buff spotting in *P. eremicus*. Dice (1939) also discussed pectoral spotting and inheritance of pelage color. Huestis (1925) discussed the inheritance of hair characters of *P. eremicus*. The occurrence of a silver-white pelage variation in *P. eremicus* was reported by Reichman and Van de Graff (1973b).

Brand and Ryckman (1969) and Lawlor (1971a) found that crosses between individuals of *P. eremicus* and *P. interparietalis* produced viable offspring. Dice (1933) noted that crosses between individuals of the subspecies *P. e. anthonyi*, *eremicus*, *fraterculus*, and *pullus* produced fertile young. Attempted matings between mainland *P. eremicus* and *P. e. tiburonensis* produced no offspring (Lawlor, 1971a). Crosses between *P. eremicus* and *P. maniculatus*, *P. leucopus*, and *P. californicus* were infertile (Dice, 1933).

REMARKS. Drs. K. N. Geluso and T. E. Lawlor, and an anonymous reviewer provided valuable criticism of the manuscript for which we are grateful.

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